Title

Aligning public and institutional incentives to advance biomedical research

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Standfirst: In the United States, scientific merit is the main criterion to determine funding for biomedical research, but not for the institutional space or support needed to perform it. Realigning the incentives of academic institutions with those of funding sources could produce better science.

Aligning Public and Institutional Incentives to Advance Biomedical Research

Over the past century, physician-scientists have made an outsized impact in biomedical research. They represent disproportionate numbers of Nobel laureates and scientific heads of research organizations[1,2]. Their decline[1] imperils the future of innovation and public health around the globe[3,4]. In recognition of this, multiple successful programs have taken advantage of the American model of protracted medical training, which in contrast to Europe requires both independent baccalaureate and doctoral degrees, to introduce physicians to scientific investigation[4,5]. Still, these programs typically invest at early career stages, such as pre- or post-graduate training or as mentored junior faculty. Though such investments are comparatively less expensive, innovation ultimately requires support for research programs themselves, as well as the investigators directing them.

In the United States, academic institutions and the federal government play complementary roles in addressing this need. Unsurprisingly, bench research requires a physical "bench," and so universities generally provide the laboratory space, scientific community, and seed funding, while the National Institutes of Health (NIH), the federal agency dedicated to health-related research, provides the necessary funding for the research itself ($53.8B in FY2024[6]). As an arm of the government, the NIH aligns its funding priorities with the public interest, determining the proposals of highest merit by peer review, fortuitously setting the norms for other funders to follow. Though an imperfect process, peer review utilizes the most qualified of referees: scientists themselves. By contrast, academic institutions are largely left to decide their priorities however they see fit. Unfortunately, such decisions are often made by local leadership and thus more susceptible to parochial viewpoints.

Rigorous scientific research requires a fertile intellectual environment, specialized equipment, and highly trained personnel, all of which are expensive. Institutions and investigators therefore face real financial pressures, and this problem is particularly acute in the clinical departments in US academic medical centers where many physician-scientists reside. In part, this is due to the uniquely American reimbursement model for health care; when faced with the need for "belt-tightening," academic medical centers, but not traditional research universities, can pursue predictable clinical revenue at the expense of long-term research goals. This can take many forms, including pressuring physician-scientists to see patients rather than perform research, prioritizing career administrators over either MD- or PhD-trained investigators for decision-making leadership posts, or strategically reallocating research space for other purposes. Ironically, the imbalance in incentives only gets worse as the payments for patient care rise, meaning that the better reimbursed, procedure-rich specialties like cardiology face larger opportunity costs for promoting research programs. Unlike the NIH, neither clinical departments nor their parent academic medical centers have a public mandate to pursue scientific inquiry. How, then, can this type of research infrastructure survive when the role of the individual institution remains required for successful innovation?

Fortunately, the blueprint for survival, and even success, already exists. Here I propose four concrete yet flexible suggestions to realign institutional incentives with scholarly investigation and the public good, all within the existing US system. Though generated in response to the ongoing physician-scientist crisis, if implemented, these concepts would benefit scientists at all institutions and could be extended to the many other funding agencies that follow the NIH model. Even outside the United States, certain aspects of these ideas could generalize to analogous funding sources, helping them identify and support the most promising science from investigators in regions or at institutions that might otherwise be overlooked.

1: Direct incentives for institutional support

NIH funding supports both the research itself (*i.e.* direct costs) and the facilities and administration provided by the institution (*i.e.* F&A, or indirect costs). Investigator support, required for project success, is subsumed by the indirect F&A costs, which leaves the institution free to decide whether adequate "support" exists. Restructuring F&A costs to explicitly acknowledge support (*i.e.* FAS costs) would increase transparency for whether institutional obligations are being met, including, but not limited to, research space, seed funding, mentorship, and an appropriate intellectual environment. The PO could assess this support through direct communication with the PI, with the "S" component withheld when commitments fail. Further, withheld components could be redirected into a larger pool to be distributed to compliant institutions. Together this would provide a cost-neutral incentive for support and a disincentive for the lack thereof (*i.e.* both a "carrot" and a "stick").

2: Develop the PO-PI relationship independent of the institution

NIH program officers (POs) are doctoral scientists overseeing grant portfolios by interacting with principal investigators (PIs). Communication often occurs through an institution's signing official (SO) or PI-generated progress reports, but this need not be the case. Setting an expectation of yearly direct communication between the PO and PI, independent of the institution, would provide several benefits. First, it will establish a lasting interpersonal relationship between scientists and strengthen professional networks in an era of team science. Second, the PO harbors a wealth of procedural knowledge ideally suited to mentor a PI of any career stage. Third, removing the SOs and their associated competing interests from the relationship frees PIs to report frank concerns about institutional misconduct, whether subtle or overt. Current whistleblower protocols focus on investigator misconduct, but PIs have little recourse when institutions are at fault. Examples of reportable concerns would include displacement from laboratory space, refusal to pay for goods or services covered by indirect costs, threats within the scientific community, or the failure of institutional or departmental leadership to comply with written commitments.

3: Transparency of support to potential trainees and recruits

There is limited transparency to potential trainees or faculty recruits on the support institutions or departments provide. Both success rates and total funding of "major" NIH grants, like career development awards for mentored scientists (K series) or research grants for independent investigators (R series), are frequently cited by leadership in recruitment or promotional pitches to illustrate a supportive environment. However, this information can be misleading, as the numbers can suffer from positive selection bias when grants become *de facto* requirements for faculty appointment. Disclosing an unbiased metric to reflect the adherence to committed support, such as achievement of the S component above, would provide potential trainees and recruits a more accurate picture of the institution under their consideration.

4: Rethinking the "environment" component of peer review

The institutional "environment" is currently one of 5 overall score driving criteria in NIH peer review, and it will still drive overall impact scores under a new review framework to be implemented in early 2025[7]. Nevertheless, it suffers from several shortcomings. First, the component can leave proposals susceptible to institutional reputational bias by reviewers[8], which can hinder the identification of the best science. Second, it can ensnare new investigators in an "unfundable" Catch-22: a fresh discipline to an established department can make the environment "wrong", but science proposed within a field already well-represented in the department can raise questions about innovation or an investigator's readiness for independence. Last, "environment" partly reflects the institutional commitment to an investigator, but institutions can deceive reviewers by implying commitments that are difficult to enforce. Removing the "environment" component as an overall score driver but retaining it as an additional discussed metric to be negotiated after peer review would solve these problems. It would free study sections to focus on the science itself, rather than parse cryptic statements, and give the NIH the power to require specific commitments for funding. By awarding a grant conditional upon any support deemed necessary by peer reviewers, the NIH would empower investigators to negotiate with their institution or transfer to a more supportive one with funding essentially in hand, without need for additional review.

Together, these suggestions would directly strengthen the relationship between funders and individual investigators and bring the goals of academic institutions into alignment with both. This would lead to more actively involved and invested program officers, more empowered scientists, less administrative overhead, and ultimately, better science. We owe it to ourselves to invest wisely in our future.

Competing Interests Statement

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